



AQUATIC TOXICOLOGY

*Proceedings of the
Third Annual Symposium
on Aquatic Toxicology*

Eaton/Parrish/Hendricks, editors

 **STP 707**

**AMERICAN SOCIETY FOR
TESTING AND MATERIALS**

AQUATIC TOXICOLOGY

Proceedings of the
Third Annual Symposium
on Aquatic Toxicology

A symposium
sponsored by ASTM
Committee E-35 on Pesticides
AMERICAN SOCIETY FOR
TESTING AND MATERIALS
New Orleans, La., 17-18 Oct. 1978

ASTM SPECIAL TECHNICAL PUBLICATION 707
J. G. Eaton, U.S. Environmental
Protection Agency,
P. R. Parrish, EG & G Bionomics, and
A. C. Hendricks, Virginia Polytechnic
Institute and State University, editors

List price \$39.50
04-707000-16



AMERICAN SOCIETY FOR TESTING AND MATERIALS
1916 Race Street, Philadelphia, Pa. 19103

Copyright © by AMERICAN SOCIETY FOR TESTING AND MATERIALS 1980
Library of Congress Catalog Card Number: 79-55939

NOTE

The Society is not responsible, as a body,
for the statements and opinions
advanced in this publication.

Printed in Baltimore, Md.
May 1980

Foreword

The third symposium on Aquatic Toxicology was held on 17–18 Oct. 1978 in New Orleans, La. This symposium was sponsored by the American Society for Testing and Materials through its Committee E-35 on Pesticides. J. G. Eaton, U.S. Environmental Protection Agency; P. R. Parrish, E G & G Bionomics; and A. C. Hendricks, Virginia Polytechnic Institute and State University, presided as chairmen of the symposium and served as editors of this publication.

Related ASTM Publications

Manual on Water, STP 442A (1978), \$28.50, 04-442010-16

**Aquatic Toxicology and Hazard Evaluation, STP 634 (1977), \$30.75,
04-63400-16**

Aquatic Toxicology, STP 667 (1979), \$37.75, 04-667000-16

**Estimating the Hazard of Chemical Substances to Aquatic Life, STP 657
(1978), \$19.50, 04-657000-16**

**Biological Data in Water Pollution Assessment: Quantitative and Statistical
Analyses, STP 652 (1978), \$17.50, 04-652000-16**

**Measurement of Organic Pollutants in Water and Wastewater, STP 686
(1979), \$36.50, 04-686000-16**

**Bacterial Indicators/Health Hazards Associated With Water, STP 635
(1977), \$34.75, 04-635000-16**

A Note of Appreciation to Reviewers

This publication is made possible by the authors and, also, the unheralded efforts of the reviewers. This body of technical experts whose dedication, sacrifice of time and effort, and collective wisdom in reviewing the papers must be acknowledged. The quality level of ASTM publications is a direct function of their respected opinions. On behalf of ASTM we acknowledge with appreciation their contribution.

ASTM Committee on Publications

Editorial Staff

Jane B. Wheeler, *Managing Editor*
Helen M. Hoersch, *Associate Editor*
Helen Mahy, *Assistant Editor*

Contents

Introduction	1
Historical Consideration of Interspecies Relationships in Toxicity Assessment—J. A. ZAPP, JR.	2
TOXICOLOGY METHODS DEVELOPMENT	
A Tentative Seven-Day Test for Predicting Effects of Stress on Populations of <i>Daphnia pulex</i>—J. G. GEIGER, A. L. BUIKEMA, JR., AND JOHN CAIRNS, JR.	13
An <i>In Situ</i> Experimental Method for Toxicological Studies on Natural Plankton Communities—J. S. MARSHALL AND D. L. MELLINGER	27
A Laboratory Test for Assessing Impacts of Substances on Developing Communities of Benthic Estuarine Organisms—D. J. HANSEN AND M. E. TAGATZ	40
BIOCONCENTRATION: WATER QUALITY MANAGEMENT	
A Critical Comparison of Two Bioconcentration Test Methods—W. E. BISHOP AND A. W. MAKI	61
Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Concentration of Chemicals in Biota—E. E. KENAGA AND C. A. I. GORING	78
An Evaluation of Using Partition Coefficients and Water Solubility to Estimate Bioconcentration Factors for Organic Chemicals in Fish—G. D. VEITH, K. J. MACEK, S. R. PETROCELLI, AND JOHN CARROLL	116
Use of Toxicity Tests in Regulating the Quality of Industrial Wastes in Canada—EDWARD PESSAH AND G. M. CORNWALL	130
Monitoring, Analysis, and Control of Toxic and Hazardous Materials in the Chesapeake Bay—C. R. BOSTATER, JR., R. V. PEPINO, AND J. V. ROLAND	142
The PCB Monitoring Program in Wisconsin—Surveillance Strategy and Use of Data—T. B. SHEFFY	155
An Automated Biological Monitoring Facility for Rapidly and Continuously Assessing Industrial Effluents—DAVID GRUBER, K. L. DICKSON, A. C. HENDRICKS, AND W. R. MILLER III	164

Effects of UV-B on Algal Growth Rate and Trace Gas Production— P. J. HANNAN, J. W. SWINNERTON, R. A. LAMONTAGNE, AND C. PATOUILLET	177
Selected Heavy Metals in Sediments and Biota from Desert Streams of the Gila River Drainage (Arizona)—M. A. LEWIS	191
<i>Lumbriculus variegatus</i>, a Benthic Oligochaete, as a Bioassay Organism—H. C. BAILEY AND D. H. W. LIU	205
Assimilation Efficiency and Clearance of Trichlorobenzenes in Rainbow Trout—A. D. SMITH, T. J. GRIFFITH, D. E. ORR, AND G. W. OZBURN	216
Heavy Metal Resistance in Aquatic Bacterial Isolates—P. L. SEYFRIED	224
A New Technique for Automatic Monitoring of Fish Ventilatory Patterns and Its Possible Use in Screening Tests for Chronic Toxicity—W. H. VAN DER SCHALIE	233
Evaluation of Early Life-Stage Toxicity Tests with Embryos and Juveniles of Sheepshead Minnows (<i>Cyprinodon variegatus</i>)—G. S. WARD AND P. R. PARRISH	243

EFFLUENT TESTING

Studies to Determine Relationships Between Time and Toxicity of an Acidic Effluent and an Alkaline Effluent to Two Estuarine Species—T. A. HOLLISTER, P. T. HEITMULLER, P. R. PARRISH, AND E. E. DYAR	251
Comparison of Heavy Metal Interactions in Acute and Artificial Stream Bioassay Techniques for the Asiatic Clam (<i>Corbicula fluminea</i>)—J. H. RODGERS, JR., D. S. CHERRY, R. L. GRANEY, K. L. DICKSON, AND JOHN CAIRNS, JR.	266
Importance of Laboratory-Derived Metal Toxicity Results in Predicting In-Stream Response of Resident Salmonids—P. H. DAVIES AND J. D. WOODLING	281

PHYSIOLOGY AND BEHAVIOR: SINGLE TOXICANT EFFECTS

Allometric Growth Response of Exercised Rainbow Trout to Cyanide Poisoning—I. R. MCCrackEN AND GÉRARD LEDUC	303
Heavy Metal Stress and Increased Susceptibility of Steelhead Trout (<i>Salmo gairdneri</i>) to <i>Yersinia ruckeri</i> Infection—M. D. KNITTEL	321
Effects of Abrupt Sublethal Gradients of Ammonium Chloride on the Activity Level, Turning, and Preference-Avoidance Behavior of Bluegills—K. S. LUBINSKI, K. L. DICKSON, AND JOHN CAIRNS, JR.	328

Use of an Unsignalled Avoidance Technique to Evaluate the Effects of the Herbicide 2,4-Dichlorophenoxyacetic Acid on Goldfish—	
G. M. RAND AND G. T. BARTHALMUS	341
Temperature Tolerance Determinations for <i>Daphnia</i>—	
L. B. GOSS	354
Acute and Chronic Effects of Dimilin on Survival and Reproduction of <i>Mysidopsis bahia</i>—	
D. R. NIMMO, T. L. HAMAKER, J. C. MOORE, AND R. A. WOOD	366
Short-Term Toxicity of Aqueous Hydrogen Sulfide to Representative Fish Species of Lake Huron—	
D. K. FUNG AND P. H. BEWICK	377

SUMMARY

Summary	399
Index	403

